

MANUFACTURING EXTENSION PARTNERSHIP

Success Stories from the Field

Thermotion LLC

Ohio Manufacturing Extension Partnership

Thermotion LLC Commits to Technology Innovation to Spur Growth

Client Profile:

Thermotion LLC designs and manufactures Electro-Thermal Actuators (ETA) for the automotive, appliance, HVAC and aviation industries. The company was founded in the 1960s as a 'job shop' for product development. One of its first products was ETA. In 1976, it became the Gould Actuator Division and developed the ETA for applications in the automotive industry. Between 1977 and 2006, the company continued to innovate on its original ETA technology, diversifying into four-wheel drive, refrigerator ice dispensers and reach-in cooler applications. Thermotion employs 20 people at its facility in Mentor, Ohio.

Situation:

Thermotion's proprietary ETA technology originally served very specific niche applications for the automotive, appliance and aviation industries. Although the company's own research and engineering team had made incremental technology updates straight along, the Thermotion found itself having difficulty penetrating new markets. Growth was stalling. "While it was clear we weren't going to expire overnight, it was also clear that, without innovation, the company would have a very limited future," said Thermotion president, Gary Swanson. After reviewing proposals from the previous three years, Swanson and his team pinpointed three critical limitations to the company's existing product line and decided to focus on developing a dramatic innovation that would deliver greater energy efficiency, longer life expectancy, and faster recharge (stroke return). These three improvements would allow Thermotion to not only outpace competitors in its current markets, but help the company gain entry into big existing markets like HVAC and growing new markets like medical devices. "We had a basic concept of what we wanted to do," Swanson recalled. "But getting it from the concept phase into a true design -- I wanted a fresh set of eyes for that. So that's when we contacted MAGNET (Manufacturing Advocacy & Growth Network, a NIST MEP network affiliate)."

Solution:

The MAGNET Product Design & Development (PDD) engineering team held an ideation session with Swanson and his engineering team. This initial session became an opportunity to bring the MAGNET team up to speed on Thermotion's proprietary technology and the challenges they wanted to overcome. The Thermotion team met with the MAGNET PDD team on a weekly basis to review conceptual models, mechanical drawings and 3-D prototypes. "Our process with the MAGNET group has been really enjoyable on a number of levels," said Swanson. "Not only did we get the job done, but we developed an esprit de corps. We felt they were as involved as our own guys, and that they recognized that this little gadget was a do-or-die proposition for us. The MAGNET engineers really understood that." Mike Keller, Senior Design Engineer with MAGNET PDD, said the Thermotion R&D engineering team brought a deep knowledge of their company's technology and applications that enhanced the design process. "They were great to work with," Keller said. "We often work with companies that have no engineering staff at all. And since this new product was incorporating some of

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the technology from their existing products, we really benefited from their expertise."

After modeling the initial design prototypes, the MAGNET PDD team created working prototypes for bench testing by machining a glass-filled nylon material that could survive intense heat and cold. "We discovered that the extruded material we were using had residual stresses, so that once we machined them down to a thin wall stock, under certain conditions they would tend to warp," recalled Keller. To create prototypes sturdy enough for field testing, the MAGNET team created aluminum insert molds so they can manufacture real injection-molded parts. These prototypes will show exactly how they will function in mass production. The shape of Thermotion's original working design had a long, narrow footprint. During one of the design conferences, Swanson suggested an idea that allowed the designers to shrink the entire assembly in half, creating a much more compact footprint. This will be a real selling point to customers who want a device that will just "plug-and-play."

Swanson said the MAGNET team's ability to rapidly create FDM (Fused Deposition Modeling) prototypes saved Thermotion tens of thousands of dollars by eliminating costly retooling after release to production. FDM is a solid-based rapid prototyping method that extrudes material, layer-by-layer, to build a model. The system consists of a build platform, extrusion nozzle, and control system. The build material, a production quality thermoplastic, is melted and then extruded through a specially designed head onto a platform to create a two-dimensional cross section of the model. The cross section quickly solidifies, and the platform descends where the next layer is extruded upon the previous layer. This continues until the model is complete, where it is then removed from the build chamber and cleaned for shipping.

With MAGNET's assistance, the new design surpassed all Thermotion's performance improvement targets. By late 2009, Thermotion was ready to offer its innovative new product for field testing with one of its major clients, the U.S. military. By the summer of 2010, the new technology was installed on several different ground vehicles, including the Humvee, which is used by all branches of the military and by the defense departments of many other countries.

Results:

- * Projected sales increase of \$5 million to \$7 million.
- * Avoided \$100,000 in unnecessary investments.
- * Improved energy efficiency from 18-20 watts to less than 1 watt.
- * Increased life expectancy from 1-2 years to 10 years.
- * Improved recharge from 1 minute to instantaneous.
- * Retained 14 jobs.

Testimonial:

"I was pleasantly surprised with the rapport which developed between the MAGNET engineers and our guys. The MAGNET team was very enthusiastic about this project."

Gary Swanson, President